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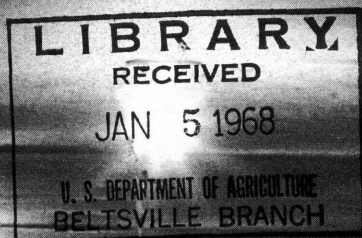
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DEPARTMENT OF AGRICULTURE

FARMERS' BULLETIN NO. 2229

# LIGHTING POULTRY HOUSES



# LIGHTING POULTRY HOUSES

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Planned electric lighting to control daylength in poultry houses helps stimulate both egg and meat production. Most types of poultry need a planned lighting program.

Chickens reach sexual maturity in 16 to 22 weeks after they are hatched. Chicks hatched from February to June begin laying in late summer or early fall when daylight is decreasing. Unless artificial light is used, the laying period may be short and the number of eggs may be reduced.

Chicks that are hatched from

October to March begin laying in spring or summer when the days are long enough for good egg production. But these chickens may begin laying fewer eggs in September unless artificial light is used.

Normal-season poults hatched April through August reach sexual maturity when natural daylight is decreasing or is less than 12 hours. Until daylight increases to about 12 hours these turkeys will fail to lay well.

Out-of-season turkey hens hatched from September through



Latitude of locations in the United States.

March may reach sexual maturity as early as 21 weeks of age. Because they mature too rapidly, and are physically underdeveloped, these turkeys seldom lay many eggs. But when a restricted lighting program is used correctly, physical maturity is retarded until adequate body weight is attained and they produce more eggs.

## LIGHTING SYSTEM DESIGN

Light levels are measured in foot-candles, and recommended levels can be provided in your poultry house by either incandescent or fluorescent electric lamps. The visible light output of electric lamps is rated in lumens. A rating in lumens per lamp gives the total amount of visible light emitted from a single lamp.

The following list shows the approximate lumen per lamp output for common sizes of incandescent and fluorescent lamps.

### Average Lumens Per Lamp

Incandescent	
Watts	Lumens
15-----	125
25-----	225
40-----	430
50-----	655
60-----	810
100-----	1, 600
150-----	2, 500
200-----	3, 500

Fluorescent	
Watts	Lumens
15-----	500 to 700
20-----	800 to 1, 000
40-----	2, 000 to 2, 500
75-----	4, 000 to 5, 000
200-----	10, 000 to 12, 000

In poultry houses, light levels at bird height can vary from less than 1 foot-candle of artificial light to 10,000 foot-candles of direct sunlight. In most artificially lighted poultry houses, however, light levels range from 1 to 30 foot-candles.

Two lumens of output per lamp for each square foot of floor area provide an average light level of about 1 foot-candle in most poultry houses. This ratio accounts for the efficiency of the entire lighting system, including lamp output, reflectance of walls, and other factors. Occasional cleaning of lamps is required to maintain lumen output.

Lamps should be arranged so they will provide nearly uniform lighting at bird level. Normally, the lamp fixtures will be installed in rows the length of the poultry house.

The distance from the two outside rows of lamps to the walls should be no more than the distance from the lamps to the floor; and the distance between lamps and between rows of lamps preferably should be 1½ times but no more than 2 times the distance from the lamps to the poultry. In cage layer houses the lamps are normally located between rows of cages.

The following example shows how you can determine the number and size of lamps you should use in your lighting program.

Suppose your poultry house is 40 feet wide and 144 feet long, and your lamps will be installed 8 feet above the poultry.

If the outside rows of lamps are installed 8 feet from the walls, 24 feet remain between the two rows.



A row of lamps down the middle of the house provides the required spacing.

Next determine the number of lamps needed in each row. Maximum spacing is, of course, 16 feet, but a 12-foot spacing is desirable. Since your poultry house is 144 feet long, 12 lamps per row spaced 12 feet apart is a good solution. The

lamps at the ends of the rows will be 6 feet from the walls. This gives three rows of 12 lamps each in your poultry house, a total of 36 lamps.

Next you determine the size of lamps required. You know that floor space equals 5,760 square feet and 2 lumens of lamp output per square foot is needed to obtain an illumination level of 1 foot-candle.



Incandescent lighting system in a large cage-layer house. If multideck cages are used, lamps should be above the alleys between rows of cages so the light falls directly on the feed and water troughs.

Multiply 5,670 by 2, and you find a total of 11,340 lumens is required to obtain a light level of 1 foot-candle. Now, suppose your lighting program calls for a light level of 2 foot-candles. Multiply 11,340 lumens by 2 foot-candles and you get 22,680 lumens, the number you need for a light level of 2 foot-candles.

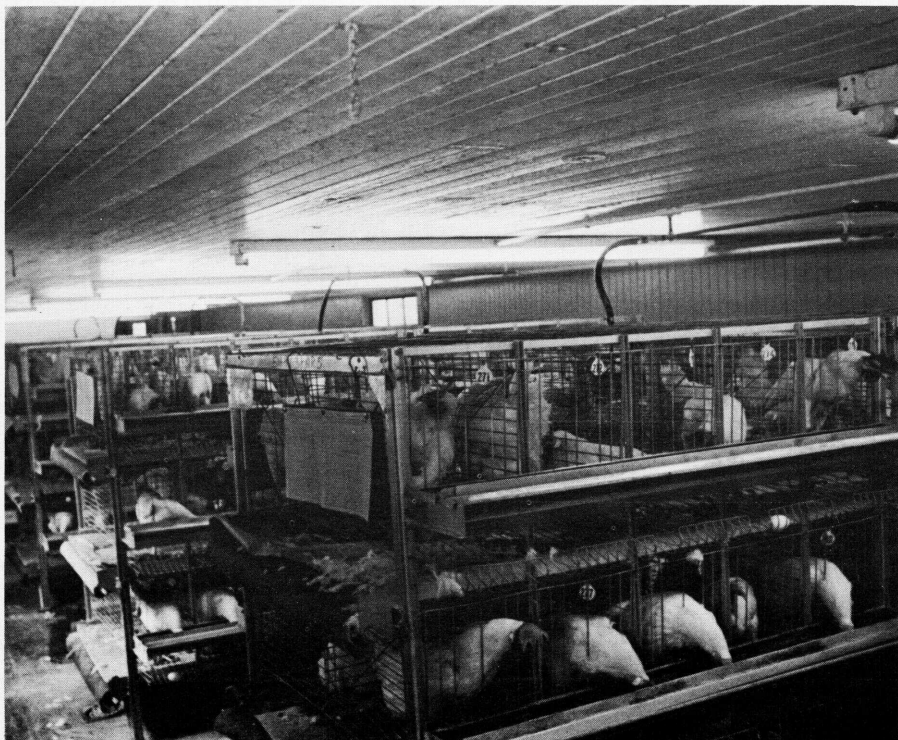
To find the size lamp, divide the number of lamps into the total lumens. This gives the lumens required per lamp. Select a size lamp from the list on page 2. When the lumen per lamp falls between lamp ratings, use the next larger size or recalculate using other lamp spacings.

In this example, divide 22,680

lumens by 36 lamps. This gives 630 lumens per lamp. From the list on page 2, you find that a 50-watt incandescent lamp or a 15-watt fluorescent would give the required lumens for 2 foot-candles at the bird level.

Both incandescent and fluorescent lamps have been used successfully in lighting poultry houses. Incandescent lamps normally are used in poultry houses with low ceilings, 7 to 8 feet.

The cost of lamps, fixtures, and installation of incandescent lamps is less than for fluorescent lamps, but incandescent lamps cost more to operate and produce fewer lumens per watt. Incandescent lamps last only 750 to 1,200 hours; fluores-



Fluorescent lighting used for caged layers in a research facility.

cent lamps last from 5,000 to 10,000 hours. The light output of most fluorescent lamps decreases when the air temperature drops below 60° F.

High-wattage lamps usually are required for lighting poultry outdoors. Mercury-vapor, metallic arc, and incandescent lamps are used. All fixtures, lamps, and wiring in outdoor systems should be of the weatherproof type.

For details of outdoor lighting, consult your power supplier or agricultural extension office.

## **LIGHTING PROGRAMS**

You may use any of the lighting programs discussed in this bulletin. All of them are successful, as shown by research and practical experience.

You may combine artificial light with natural light; you may use artificial light alone; or, when there is sufficient natural light, you may use natural light alone. If you combine the two, you can turn on the light before sunrise or after sunset to get the extra hours of light you need.

If you use only artificial light, you will need a windowless poultry house that is well ventilated and can be closed against daylight.

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## **SAFETY SUGGESTIONS**

Be sure your poultry lighting is properly installed and meets all safety requirements. Only material approved by Underwriters' Laboratories should be used. All wiring should conform to local or the National Electrical Code.

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Cooling may be necessary in some areas. For example, your lighting program may call for 6 hours of light at a time of year when daylight lasts 12 hours. If so, you will need a windowless house in which to give your poultry fewer hours of artificial light.

The intensity of the light you use depends first on the type of poultry you raise and second on the amount of light you need during work periods in your poultry house.

Lighting of 1 to 2 foot-candles may be sufficient for poultry production but too dark for you to work efficiently. Therefore, two lighting systems are sometimes used in windowless houses—one to light the poultry and one to give sufficient light for you to see. Added light during work periods will not disrupt your lighting program.

Lighting programs for various kinds of poultry are discussed in this section. The table on page 6 summarizes the programs. The programs are designated A, B, and C in both the discussion and the table of lighting programs.

## **Chickens**

### **Broilers**

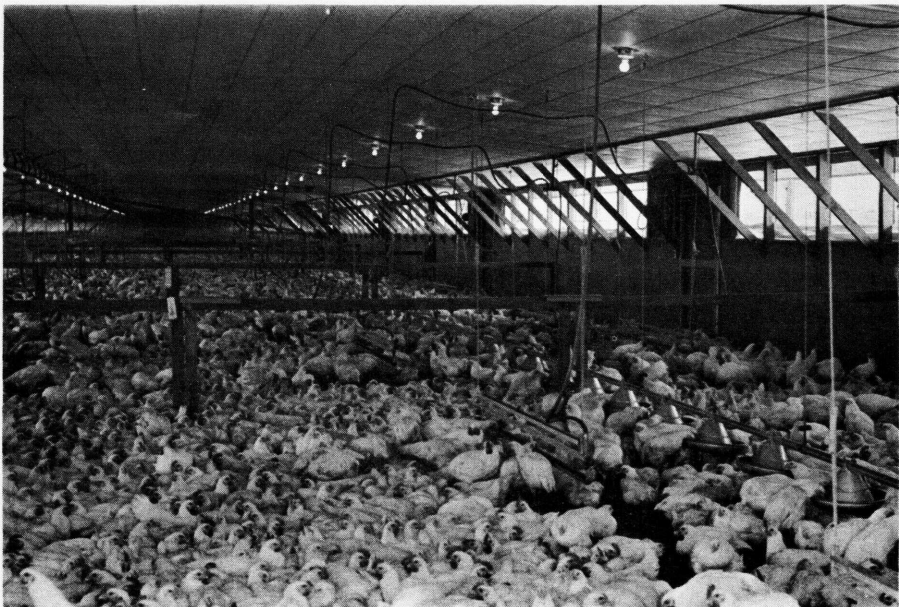
You should give your chicks 24 hours of light daily until they have found the feeders and waterers. This usually takes 3 to 7 days.

When your chicks have found the feeders and waterers, you may use one of three lighting programs. These are (A) daylight, (B) a day split equally between 12 hours of light and 12 hours of darkness, or



## Lighting Programs for Poultry

Type of poultry	Age (weeks)	Minimum light intensity (ft.-c)	Lighting programs (hours of light)		
			A	B	C
Chickens:					
Broilers .....	0-3 .....	1. 0	24 .....	24 .....	24.
Broilers .....	3 and up .....	0. 5	daylight ..	12 .....	22 or 24.
Pullets .....	0-3 .....	1. 0	20-24 .....	20-24 .....	20-24.
Pullets .....	3-16 .....	1. 0	12-16 .....	13-22, decrease 15 min. weekly.	6-10.
Pullets .....	16-22 .....	1. 0	8 .....	decrease 15 min. weekly.	6-10.
Layers and breeders ..	22 and up ..	1. 0	14-16 .....	increase 15 min. weekly.	16.
Turkeys:					
Market stock .....	0-5 .....	2. 0	24 .....	.....	.....
Market stock .....	5 and up .....	0. 5	daylight ..	.....	.....
Breeder hens .....	0-5 .....	2. 0	24 .....	24 .....	24.
Breeder hens .....	5-8 .....	2. 0	daylight ..	normal day-length.	daylight.
Breeder hens .....	8-22 .....	2. 0	daylight ..	6-8 .....	daylight.
Breeder hens .....	22-30 .....	2. 0	daylight ..	6-8 .....	8.
Breeder hens .....	30 and up ..	2. 0	13-15 .....	13-15 .....	13-15.
Breeder toms .....	0-5 .....	2. 0	24 .....	24 .....	24.
Breeder toms .....	5-30 .....	.....	daylight ..	daylight ..	daylight.
Breeder toms .....	30 and up ..	2. 0	13-15 .....	13-15 .....	13-15.



Lights for broilers in a house with a capacity of 10,000 birds.

ST 269-16





A broiler house with two lighting systems—one for the poultry and the other to provide light for service work.

(C) a long day with a schedule of 22 hours of light and 2 hours of darkness, or a schedule of 24 hours of continuous light.

Some broiler raisers have reported that chicks grow faster on less feed when the light intensity is limited to 1 foot-candle. In the table of lighting programs on page 6, a minimum of 1 foot-candle is recommended for chicks up to 3 weeks of age and a minimum of 0.5 foot-candle from 3 weeks to market.

### **Pullets**

Until pullets are 3 weeks old, you should give them 20 to 24 hours of

light daily. From 3 to 22 weeks of age, you may give them either (A) a constant-light day, (B) a decreasing-light day, or (C) a short-light day. These programs cut down physical activity and stimulate growth.

If you use a constant-light day (A), give your pullets 12 to 16 hours of light until they are 16 weeks old. Then from 16 to 22 weeks of age, give them 8 hours. This program requires a windowless house, one that is ventilated and light-proof.

The decreasing-light day (B) is also called the step-down method. You begin the program with 13 to 22 hours of light. The number of



hours depends on the time of year and the area in which you live.

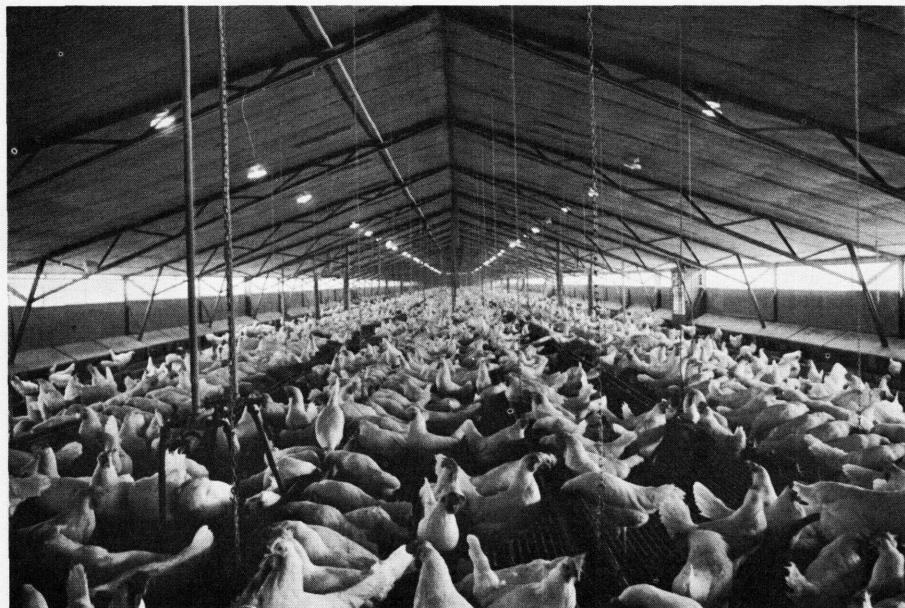
To use the step-down method, get the latitude nearest to your poultry farm from the map on page 1. Next, in the correct latitude column of the table on page 9, find the daylength when your pullets will be 22 weeks old. Add 5 hours to this daylength. The result will be the hours of light you should give your pullets at the beginning of the program. Then decrease the light 15 minutes a week until your pullets are 22 weeks old. When you use the decreasing-light day, you must change your time clocks every week.

In a short-light day (C), give your pullets a total of 6 to 10 hours of light daily between 3 and 22 weeks of age.

## Layers and breeders

The lighting program you use for your layers and breeders is an extension of the program you used for your pullets. For example, if you used program A for your pullets, you should continue with program A for your layers and breeders.

When your layers and breeders are 22 weeks old, begin one of the following programs: (A) Give 14 to 16 hours of light daily; (B) start increasing the light 15 minutes weekly and continue until your chickens are getting the hours of light you want them to have, up to a full 24 hours; or (C) give 16 hours of light daily. Shifts in lighting programs can be either abrupt or gradual.



ST 270-21

Lighting for White Leghorn layers in a poultry house with a slatted floor. The high lamp placement provides nearly uniform light distribution with a relatively few high-wattage lamps.

# Daylength, Sunrise, and Sunset for Latitudes<sup>1</sup> 30° N., 38° N., and 45° N.

Hatch date	Latitude of poultry house								
	30° N.			38° N.			45° N.		
	Daylength (hours)	Sunrise (a.m.)	Sunset (p.m.)	Daylength (hours)	Sunrise (a.m.)	Sunset (p.m.)	Daylength (hours)	Sunrise (a.m.)	Sunset (p.m.)
Jan. 1	10:15	6:56	5:11	9:35	7:16	4:51	8:51	7:38	4:29
Feb. 1	10:46	6:51	5:37	10:18	7:05	5:23	9:48	7:20	5:09
Mar. 1	11:33	6:26	5:59	11:21	6:32	5:53	11:08	6:39	5:47
Apr. 1	12:29	5:50	6:19	12:37	5:46	6:23	12:46	5:41	6:27
May 1	13:20	5:17	6:37	13:47	5:04	6:51	14:15	4:50	7:05
June 1	13:57	4:59	6:45	14:38	4:39	7:17	15:22	4:17	7:39
July 1	14:03	5:02	7:05	14:46	4:41	7:27	15:33	4:17	7:50
Aug. 1	13:34	5:19	6:53	14:06	5:03	7:09	14:42	4:45	7:27
Sep. 1	12:46	5:37	6:23	13:01	5:29	6:30	13:16	5:22	6:38
Oct. 1	11:53	5:53	5:46	11:49	5:55	5:44	11:43	5:58	5:41
Nov. 1	10:59	6:14	5:13	10:36	6:25	5:01	10:11	6:38	4:49
Dec. 1	10:22	6:38	5:00	9:44	6:57	4:41	9:02	7:18	4:20

<sup>1</sup> All figures are local civil times and may vary a few minutes from local standard times.



## **Turkeys**

### **Market stock**

You should give all turkey poults 24 hours of light daily until they are 5 weeks old. Because poults sometimes have poor eyesight, they should be given brighter light than chicks. You may need extra lamps above the feeders and waterers to give your poults 5 to 10 foot-candles of light.

After the first 5 weeks, meat turkeys need only daylight for good growth.

### **Breeder hens**

Up to 5 weeks of age prospective breeder hens, like all other poults, should get 24 hours of light daily.

The programs for breeder hens between 5 and 30 weeks of age are (A) daylight, (B) artificial light, and (C) a combination of daylight and artificial light. When hens reach maturity at 30 weeks of age, all three programs call for stimulatory lighting of 13 to 15 hours of light daily.

You should use the daylight program for normal season hens that were hatched April through August. These hens need no artificial light between 5 and 30 weeks of age. When they are about 30 weeks old, start giving them 13 to 15 hours of light to stimulate egg production.

The artificial-light program can be used any time of year. You will need a windowless poultry house that is well ventilated, and closed against sunlight.

When your hens are 5 to 8 weeks

old, give them artificial light during the hours of normal daylight. From 8 to 30 weeks of age, give them short-light days of 6 to 8 hours. After 30 weeks, give them 13 to 15 hours of light daily.

Out-of-season hens that were hatched in the fall and winter, September through March, start laying in the summer and fall. You may use the program of combined daylight and artificial light for these hens.

Between the ages of 5 and 22 weeks, fall and winter hatched hens need only daylight. At 22 weeks, you may use either of two lighting schedules. You can give them a short-light day of 6 to 8 hours, using a minimum of 2 foot-candles of light as shown in the table of lighting programs. Or you may give them a long-light day of 14 hours, using dim light of less than 0.1 foot-candle. The schedule of long-light days is not shown in the table.

Both schedules should be discontinued when your hens are 30 weeks old. At 30 weeks, begin the regular lighting program of 13 to 15 hours daily to stimulate laying.

### **Breeder toms**

Up to 5 weeks of age, toms should get the same lighting as market turkeys and breeder hens.

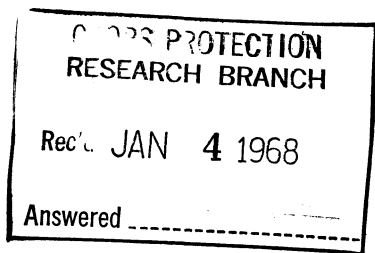
After male turkeys are 5 weeks old, they need only daylight for good growth regardless of when they were hatched. But if you start toms on a stimulatory lighting program 3 to 4 weeks before you light the hens, they will be in better breeding condition when first needed for mating.

Toms should be at least 26 weeks old before you start the lighting program, which requires 13 to 15 hours of light daily.

If you wish, you can start the stimulatory program with 13 hours of light and increase it gradually. Turn on the lamps as soon as necessary before sunrise to get the 13 hours of light you need.

When you start the stimulatory lighting from December through February, the later sunsets will lengthen the days naturally. At other times of the year, you can increase the light-day 15 to 30 minutes weekly with artificial light to a maximum of 17 hours.

When you start using your toms as breeders, give them the same lighting you give your hens.



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